Table: A-1 HOOKUP FOR SPECIFIC RADIOS

MFGS. OR RADIOS	PLUG TYPE	MIC. AUDIO To Pin 1 of radio port	PTT To Pin 3 of radio port	RX. AUDIO To Pin 4 of radio port	GROUND To Pin 2 of radio port
KENWOOD	4 Pin	Pin 1	Pin 2	Speaker	Pin 3, 4
	5 Pin	Pin 1	Pin 2	Speaker	Pin 4, 5
	6 Pin	Pin 1	Pin 2	Speaker	Pin 6
	8 Pin	Pin 1	Pin 2	Speaker	Pin 7, 8
TR-2500	HTs	Tip - Large	Sleeve - Large	Tip - Small	Sleeve -Small
TH-x1xx	HTs	Ring - Large	Sleeve - Large	Tip - Small	Sleeve -Small
TH-xx5	HTs	Ring - Large	Sleeve - Large	Tip - Small	Sleeve -Small
TH-x5	HTs	Ring - Large	Sleeve - Large	Tip - Small	Sleeve -Small
TH-x6	HTs	Ring - Large	Sleeve - Large	Tip - Small	Sleeve -Small
TH-x8	HTs	Ring - Large	Sleeve - Large	Tip - Small	Sleeve -Small
ICOM	4 Pin	Pin 1	Pin 2	Speaker	Pin 4
	8 Pin	Pin 8	Pin 6	Speaker or Pin 8	Pin 6, 7
	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
YAESU	4 Pin	Pin 2	Pin 3	Speaker	Pin 1
	8 Pin	Pin 8	Pin 6	Speaker or Pin 8	Pin 7
FT-208	HTs	Pin 1	Pin 2	Pin 3	Pin 4
FT-x09	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-x3	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-727	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-x5	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-x6	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-x1x	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves
FT-470	HTs *	Tip - Small	Tip - Small	Tip - Large	Sleeves

* Some ICOM and YAESU HTs key the transmitter by completing the ground connection on the microphone. If your HT is one that is noted in the above chart, you must follow the instructions given in Chapter 3 of this instruction manual.

NOTE: The radio connection information listed in the above chart is believed to be accurate. However, you should check the accuracy of this information with the instruction manual of your radio. **MFJ Enterprises, Inc. is not responsible for any inaccuracy of information listed in the above chart.**

FAST - START™

Easy-to-follow guide to connecting your new MFJ TNC-2 between your radio and computer.

INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment

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REVISION 1.2.9

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This MFJ TNC-2 Fast-Start Manual is intended to provide you with the minimum information necessary to install your MFJ TNC-2 as quickly as possible. For advanced operation, please see the main MFJ TNC-2 instruction manual.

If you purchased the "Turbo" version of the TNC-2 (MFJ-1270BT or MFJ-1274T) both the main TNC-2 instruction manual and this Fast-Start Manual are applicable. Note that the MFJ "Turbo" TNC-2 allows operation of 300 baud, 1200 baud and 2400 bps packets where as the standard TNC-2 allows operation of 300 baud and 1200 baud packets.

If you purchased the MFJ TNC-2 with the 9600 baud modem built-in (MFJ-1270BQ or MFJ-1274Q) you must follows instruction provided in the MFJ-9600 modem for radio installation. Operation of 9600 buad packet required radio modification. With the 9600 baud modem installed, the MFJ TNC can operate 300, 1200 and 9600 packets.

The Computer Installation section in this Fast-Start Manual assumes that you have purchased one of the MFJ Starter Packs. If you are not using the MFJ Starter Pack, you should refer to the MFJ TNC-2 main manual for computer interface connections. You may use the Radio Installation and the other parts of the Fast-Start manual for installing your MFJ TNC-2.

Your MFJ Starter Pack consists of a cable to connect between the MFJ TNC-2 and your computer and a terminal program to run on your computer.

The Starter Packs available are MFJ-1284 or MFJ-1289 for IBM and compatible, MFJ-1282 for Commodore 64/128 or MFJ-1287 for Macintosh.

In addition to the installation information, this Fast-Start Manual also includes commands and features of the MFJ TNC-2 which are not documented in the main instruction manual provided with the MFJ TNC-2.

INSTALLATION

I. Power Supply

Your MFJ TNC-2 is supplied with an AC adapter. Plug the power supply into a 110 V AC outlet and plug the 2.1 mm coaxial plug into "POWER" jack locate at the rear of the MFJ TNC-2. For operation on other than 110 AC line voltage, you must obtain a suitable AC adapter that will provide output of 300 mA at 12 VDC to operate your MFJ TNC-2.

If wiring of a power plug to the MFJ TNC-2 is necessary, wire a 2.1 mm coaxial plug so that the center pin is positive (+) and the outside sleeve is ground (-).

Optional items available for your MFJ TNC are as follows:

Model No	Description
MFJ-1272B	TNC to Microphone switch box
MFJ-43	TNC Real time clock, keeps your 1278 on-time
MFJ-40E*	Special firmware with packet encryption mode
MFJ-47A	32K RAM packet mailbox expansion board
MFJ-47B	128K RAM packet mailbox expansion board
MFJ-47C	512K RAM packet mailbox expansion board

*This special MFJ TNC EPROM firmware release features encrypted packet mode. This is designed for commercial use only. Contact MFJ Enterprises, Inc. for more detail.

Above optional items are available from MFJ dealers or directly from MFJ Enterprises, Inc.

II. Computer Interface

This computer installation applies to those who are using the MFJ Starter Pack with IBM and compatibles, Commodore C64/128 and Macintosh computers. If you are not using one of these computers, or if you are not using an MFJ Starter Pack, you must refer to the main MFJ TNC-2 instruction manual for computer installation.

The cable supplied with the Starter Pack must be used in this installation. If you are NOT using the Starter Pack computer cable to make this connection, you should refer to the main MFJ TNC-2 instruction manual, Chapter 2 "Computer Interfacing" to verify that the cable you are using is correctly wired.

WARNING: AN IMPROPERLY WIRED CABLE COULD DAMAGE YOUR MFJ TNC-2 OR YOUR COMPUTER!!

1. Connect the cable from the computer to the MFJ TNC-2 as follows:

   o IBM and compatibles:

   Connect the cable end with DB-25 male to the back of the MFJ TNC-2 RS-232 connection mark "RS-232". Then connect the other end of the cable with DB-25 female to COM 1 or COM 2 RS-232 port of your computer.

   o Commodore C64/128

   Connect the cable end with 8-pin TTL connector to the back of the MFJ TNC-2 TTL connector marked "TTL". Then connect the other end of the cable to the user port of the C64/128.

   Follow the instruction supplied with the Starter Pack carefully. Make sure that the cable is wired correctly and also make sure that the connector is oriented properly before plugging it to the MFJ TNC-2 and the computer.

   o Apple Macintosh

   Connect the cable end with DB-25 female to the back of the MFJ TNC-2 RS-232 connector marked "RS-232". Connect the other end of the cable to the computer modem port.

2. Load the terminal program by following the procedure described in the terminal program documentation.

3. Make sure that the terminal program parameters are set as follows:

   Baudrate: 9600 (1200, 2400 or 4800 for C64/128)
   Wordlength: 8
   Stopbit: 1
   Parity: None

MFJ-1214

MFJ TNC-2 Fast-Start & Supplement Manual Installation

4. Locate the DIP switch on the rear of the TNC-2 and set the switch settings by using the following table:

Computer Baud Rate	Switch 1	2	3	4	5
300	**ON**	OFF	OFF	OFF	OFF
1200	OFF	**ON**	OFF	OFF	OFF
2400	OFF	OFF	**ON**	OFF	OFF
4800	OFF	OFF	OFF	**ON**	OFF
9600	OFF	OFF	OFF	OFF	**ON**
19200*	ON	OFF	OFF	OFF	OFF

*To set the MFJ TNC to operate terminal baud rate of 19200 baud, the TNC mother board must be modified. Operation at 19200 terminal baud is necessary only if you are using the MFJ TNC to operate on 9600 baud packet. See the end of this manual for this modification.

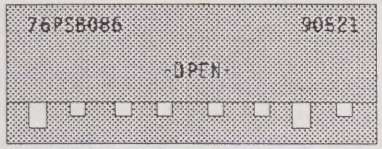
If you have purchased the MFJ TNC with the 9600 baud modem installed. This modification is already installed.

If you are using one of the terminal programs supplied with the MFJ Starter Pack, to match the default for these programs, you will need to set terminal baud rate as follows:

IBM and Compatibles using MFJ-1284 or MFJ-1289					
Baud Rate	Switch 1	2	3	4	5
9600	OFF	OFF	OFF	OFF	**ON**
Commodore C64/128 using MFJ-1282					
Baud Rate	Switch 1	2	3	4	5
2400	OFF	OFF	**ON**	OFF	OFF
Commodore C64/VIC-20 using MFJ-1283					
Baud Rate	Switch 1	2	3 4		5
300	**ON**	OFF	OFF	OFF	OFF
Apple Macintosh using MFJ-1287					
Baud Rate	Switch 1	2	3	4	5
9600	OFF	OFF	OFF	OFF	**ON**

IMPORTANT: A note about the dip switch on your TNC-2.On the back panel of the TNC-2, you will find either a RED dip switch or a BLACK dip switch. Refer to the drawing below to determine the OFF and ON positions of the dip switch used by your TNC-2.

1. RED Dip Switch: The OFF position is DOWN



2. BLACK Dip Switch: The OFF position is UP

5. Turn on the MFJ TNC-2.

   MFJ TNC-2 will initialize with the sign-on message and end with the CMD: command prompt.

   If the sign-on message is garbled, this may be caused by the wordlength and parity of MFJ TNC-2 not matching the terminal program parameters. Turn the TNC-2 OFF. Remove the cover of the TNC-2 and disconnect the shortig jumper JMP 5. JMP 5 is located next to the battery. After about 2 minutes, reconnect the shorting jumper at JMP 5.

Note: Removing JMP 5 disconnects the memory backup battery and resets all MFJ TNC-2 parameters to default values. The wordlength and parity default values of the MFJ TNC-2 are 8 bits and no parity respectively. This matches the terminal parameters as suggested above in step 3.

6. Type "Display" and press "Return" key.

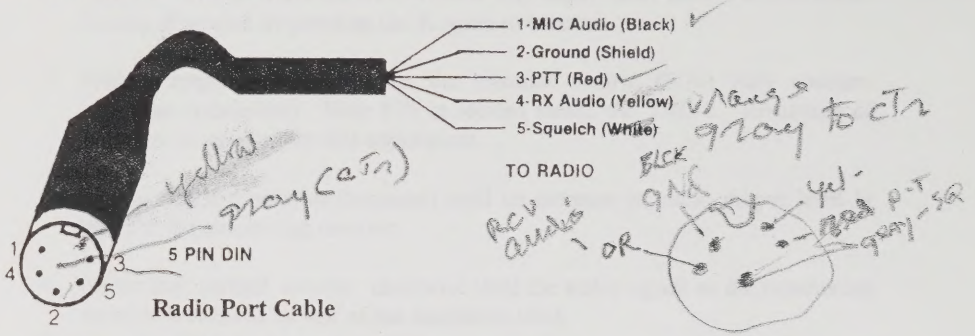
   MFJ TNC-2 will display a long list of parameters and end with the **CMD:** command prompt. This procedure verifies that the MFJ TNC-2 is communicating with your computer.

III. Radio Interface

The first step in connecting the MFJ TNC-2 is to wire a cable to connect the MFJ TNC-2 Radio Port to the microphone or accessory connector of the radio. The radio cable supplied with your MFJ TNC-2 has one end already wired with a 5-pin DIN connector.

MFJ offers optional pre-assembled cable to connect the TNC-2 to some radios. Contact an MFJ dealer or MFJ for more information about these pre-assembled cables. Also available from MFJ dealer or from MFJ is a "TNC-to-Microphone" switch box (MFJ-1272B) which allows you to switch your radio between using the TNC or the microphone without disconnecting cables. Contact MFJ or MFJ dealer for more information concerning this TNC/MIC switch box. If pre- assembled cable or switch box is not available then you must wire a cable to fit your radio.

1. Wire the radio cable to MFJ TNC-2 as shown by the following diagram:



Radio Port Cable

Note: Specific wiring diagrams for many Kenwood, ICOM & Yaesu radios are shown at the end of this Fast-Start manual. Check to see if your radio is listed.

2. Once the cable is properly wired, connect the DIN end to the MFJ TNC-2 Radio port. Connect the other end to the radio.

3. Before operation is possible, you must set the TNC-2's radio baud rate to match the operation mode you selected to operate. The TNC-2 is capable of operation 300 baud and 1200 baud packet. In addition, you may install an external modem to operate 2400 bps or even at a higher speed. Refer to the following chart to set the dip switches located at the rear panel of the TNC-2.

Radio Baud Rate	Switch		
	6	7	8
300	**ON**	OFF	OFF
1200	OFF	**ON**	OFF
2400 or 9600	OFF	OFF	**ON**

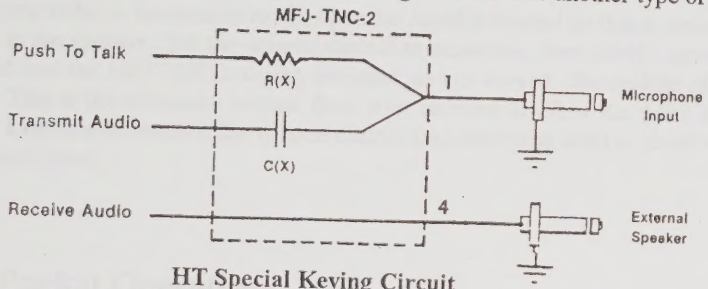
For example: From the above table, if you wish to operation 1200 baud packet then you will set the dip switches so that switch 6 is OFF, 7 is ON and 8 is OFF.

Special Note Installation for HTs:

Some HTs key the transmitter by drawing a small amount of current from the microphone input pin (see Figure below). Radios with this type of special keying circuit are ICOM-2AT (tm) and Yaesu FT-x09, FT-x3, FT-727 (tm) and others.

If your HT has this type of microphone input, you can wire the microphone like the one shown in Figure below or you can remove the cover of the MFJ TNC-2 and install a shorting jumper at JMP K. Installing JMP K of soldering "Cx" and "Rx" to the microphone cable. "Cx" and Rx" are installed on the MFJ TNC-2 mother board. On the TNC-2 mother board, the "Rx" resistor for Radio Port is R107. If after installation JMP K and you find that your radio still would not key properly, it may be necessary for you to change the value of R107 to a smaller value.

Be sure to remove **JMP K** when connecting the TNC-2 to another type of radio.



HT Special Keying Circuit

4. After properly connecting the MFJ TNC-2 to the computer and to your radio and properly setting the radio baud rate in the terminal program, make sure that the other terminal program parameters are set as described in the "Computer Installation" section above.

5. Turn on the MFJ TNC-2. The TNC-2 will initialize with the display of the sign-on message and end with the cmd: command prompt.

IV. Transmit Audio Level Setting.

Before you start to use the MFJ TNC-2, you must set the transmit audio level properly.

A. VHF Radio Transmit Audio Level Setting:

1. Connect the radio to a dummy load and listen to the transmission with another radio nearby.

2. With the MFJ TNC-2 set-up in the VHF packet (1200 baud) mode and under the cmd: command prompt, type:

   CALIBRA <CR>

3. Type **K**, then press the space bar for the higher of the two tones transmitted by the MFJ TNC-2. Note the MFJ TNC-2 will unkey itself after a few seconds. Re-key, if needed by pressing the **K** again to transmit.

4. With a small screwdriver turn the transmit control (R76) fully counter-clockwise (minimum). Note R76 is located inside the TNC-2. Removing of the cover is required for this adjustment.

5. Slowly turn it clockwise (increase) until no increase in audio output level is heard at the monitoring receiver.

6. Rotate the control counter clockwise until the audio signal on the monitoring receiver is reduced by half of the maximum level.
7. Type the **K** key to return to receive mode.

8. Type the **Q** key to exit the calibration routine.

B. HF Radio Transmit Audio Setting:

1. Connect the HF radio to a dummy load, then connect the TNC-2 to the HF radio.

2. Set the HF radio controls as follows:
   - o VOX : OFF
   - o AGC : FAST
   - o Speech Processor : OFF
   - o Mode Selector: LSB
   - o Meter Switch: Power Reading
   - o Speaker Monitor: ON (if available)
   - o Microphone Gain: 1/4 Turn

3. Under the cmd: command prompt, type:

   CALIBRA <CR>

4. Type **K**, then press the space bar for the lower of the two tones transmitted by the MFJ TNC-2. Note the MFJ TNC-2 will unkey itself after a few seconds. Re-key, if needed by pressing the **K** again to transmit.

5. With a small screw driver turn the transmit control (R76) inside the TNC-2 fully counter-clockwise (minimum).

6. Slowly turn it clockwise (increase) until at a point where output power is slightly below the rated output of your radio.

7. Type the **K** key to return to receive mode.

8. Type the **Q** key to exit the calibration routine.

V. Set the Receiver Audio Control.

With your radio in the receive mode, open the squelch control so that a steady hiss is heard in the speaker. Set the volume control to minimum, then slowly increase it to a point that the MFJ TNC-2 tuning indicator moves toward the middle of the display. This is the minimum volume from your receiver to allow the MFJ TNC-2 to copy. Continue to increase the volume control until the audio level is about twice the minimum level.

VI. Packet Operation

After properly connecting the TNC-2 to your computer and to your radio, you are now ready to operate your TNC-2. Refer to Chapter 4 of the TNC-2 Instruction manual for basic packet operation.

VII. MFJ TNC-2 2400 PACKET OPERATION

If your TNC-2 does not have the 2400 modem, an optional modem (MFJ-2400) can be purchased and installed. With the 2400 modem installed, your TNC-2 is capable of operating 300, 1200 or 2400 baud packet. The 300 baud and 1200 baud packet modes are not affected by the installation of the 2400 modem.

The addition of the 2400 modem feature will in no way require any internal modification to your transceiver.

A. 2400 Packet Operation Setup

All default parameters set for 1200 packet operation can be used for the 2400 operation. 2400 operation needs no unusual setup or parameter changes. There are however, some changes that can be made later to the TNC-2 parameters which will enable you to improve the speed the throughput performance of the 2400 operation. The "honing" of the parameters may not seem like much, but we have found that at 2400, the TNC-2 seems to be more responsive to the TXDELAY, DWAIT, RESPONSE and SLOTTIMES. When using direct connects and good paths, the MAXFRAME and PACLEN commands can be increased to allow larger packets to be moved during each transmission. When returning to the active thru-put frequencies, these two commands should be reduced to their original settings. You may find that if you were using a TXD of 50, then a TXD of 40 will now perform better. The DWAIT can be shortened or lengthened to suit the AGC recovery time of your radio. For instance, if you have been running the DWAIT of 16, it may now perform better at DWAIT of 12 or even 10. The FRACK will appear to exercise more at 2400.

2400 really shows its place in the packet world when used to pass large ASCII, BINARY and PICTURE files. It is always good to use clear frequency and/or use direct connects to the target station rather than going thru a node or digipeater. The reason is obvious. There are few 2400 nodes at the present time. However, it should be pointed out that implementation of a 2400 node is just as easy as building and using a 1200 node.

To select 2400 packet operation, the DIP switch on the rear of the TNC-2 must be set so that switch positions 6 and 7 are OFF and switch position 8 is ON.

B. Receive Audio Setting

The MFJ 2400 modem employs automatic gain control (AGC) for its receive audio. The receive audio level is pre-set for proper 2400 operation; no adjustment is necessary in most cases. If you set the receive audio of your radio properly for 1200 operation, then it will be suitable for the 2400 operation also. No adjustment for the receiver audio on the 2400 modem board is needed.

C. Transmit Audio Setting

Transmit audio on the 2400 board is set by adjusting R38 (next to T2) on the 2400 modem board. Transmit audio for the "Turbo" MFJ TNC-2 is pre-set at the factory to match the audio level of the 1200 modem on the TNC-2 mother board. Once the 1200 and the 2400 transmit audio are set to the same level, then you may adjust the audio level going into your radio by using the "Transmit Audio" controls on the left side of the TNC-2. Note that these controls set the transmit audio levels for all the operation modes of the TNC-2, including the 2400 packet operation.

When adjusting the transmit audio level please note that the range of R38 is pre-set by CN-6 header. The shorting jumper on CN-6 header sets range as follows:

CN-6 Jumper Position	Transmit Audio Range (no load)
no jumper	50 mV - 60 mV p-p
1 & 2 (default)	100 mV - 200 mV p-p
2 & 3	250 mV - 3 V p-p

VIII. COMMAND UPDATE

The following commands have been updated since the printing of the MFJ TNC-2 main manual. The main manual covers firmware up to Release 1.1.3.

FIRMWARE RELEASE NOTES

Firmware release 1.1.4 and releases after are not documented in the MFJ-1270B/1274 System Manual. They are documented in this Instruction Supplement.

RELEASE 1.1.4 NOTES:

FIXES

o - Transmitted I-frames under Level 2 Version 2 did not have their P bits set at the appropriate times. In fact, they never had their P bits set. This has now been fixed. The last I-frame of a multiple I-frame transmission has its P bit set.

o - A mistake in the protocol state table was fixed.

o - bbRAM scanning now checks all ten possible connection control structures (instead of just the first one).

CHANGES

o - AX25L2V2 defaults to the ON position.

o - Major change made to AX25L2V2 handling. If retry limit is exceeded, or the TNC receives a "disconnected" response to a poll, the connection is ended

The old method (and the one proscribed) is fraught with problems for automated stations that can not recover without an indication of loss of the connection.

The **PERMCON** control will replace the functionality of this aspect of AX25L2V2 which was removed.

ENHANCEMENTS

o - 32K of RAM is now expected. Virtually all of the new space is used to enlarge existing queues within the TNC, yielding greater performance especially at faster RF data rates, and making the on-board message buffer capability a bit more useful.

o - The **MCOM** command decodes all control fields (invalid ones are marked with ????).

For I and S frames, sequence number information is also presented. Frames compatible with the AX.25 Level 2.0 standard are also decoded as to the state of the Command/Response (C/R) and Poll/Final (P/F) bits.

Ex: WA7GXD>KV7B <I C SO RO>:
Hi Dan,

WA7GXD>KV7B <I C P S1 RO>:
have you been on EIES lately?

KV7B>WA7GXD <RR R F R2>
KV7B>WA7GXD <I C P S1 R2>:
I was just thinking about that. I heard that @(username) made some real unbelievable comment on it!

WA7GXD>KV7B <RR R F R2>
WB2SPE>KV7B <C>
KV7B>WB2SPE <DM>
KV7B>WA7GXD <I C P S2 R2>:
Good conditions now...

WA7GXD>KV7B <RR R F R3>
WA7GXD>KV7B <I C P S2 R3>:
Yes @(username) did. It was quite remarkable.

And so on. See Chapter 9 Table 9-1 in your TNC 2 manual for a breakdown of the control field codes. For complete information on the AX.25 Level 2 Version 2.0 Protocol, please refer to the ARRL AX.25 Protocol Specification document, available from ARRL.

NEW COMMANDS FOR 1.1.4

CBELL ON:OFF Default: **OFF**

Parameters:

ON Connect bell enabled

OFF Connect bell disabled

This command is used to control whether an ASCII $O7 (BELL) character is sent as part of the connected message.

When set ON, the bell character immediately precedes the asterisk portion of the connected message, e.g.:

<BELL>*** Connected to: <callsign>

CM5GDISC ON:OFF Default: **OFF**

Parameters:

ON Automatic disconnect enabled

OFF Automatic disconnect disabled

This command controls whether the TNC 2 will initiate a disconnect sequence after it is connected to.

If **CMSG** is OFF, or CTEXT has no connected text, the TNC initiates a disconnect immediately upon receiving information or acknowledgment frames from the other station.

If **CMSG** is ON end CTEXT contains some text information, the TNC initiates a disconnect after the packet containing connect text (CTEXT) is acknowledged.

This command may be useful to bulletin board operators or others with a need to send a short message, confirm its receipt, and disconnect.

NOTE: Use this command with care - If you find you're able to receive connects, yet never get data, it's possible **CMSGDisc** has been left on. It's also possible is that RS- 232 DCD is holding the terminal off -- see the TNC 2 System Manual for details on hardware flow control.

LFIGNORE ON:OFF Default: **OFF**

Parameters:

ON TNC will ignore <LF> characters.

OFF TNC will respond to <LF> characters.

This command controls whether TNC 2 responds to ASCII Line Feed (<LF> $OA) characters or ignores them in command and converse modes.

When turned on, line feeds are totally ignored except in transparent mode.

New HEALTH Counters

BBfailed n : Counts number of times bbRAM checksum was in error.

TXQovflwn : Counts how many times frames were discarded because the outgoing frame queue was too small.

RELEASE 1.1.5 NOTES

FIXES

o - Release 1.1.4 suffered from a spurious condition where the HDLC transmitter would time out. When this happened TXQOVFLW would typically show a non-zero count. Release 1.1.5 incorporates an HDLC transmitter timeout feature to capture and recover from the timeout error.

o - DWAIT operation has been fixed.

NEW COMMANDS FOR 1.1.5

BBSMSGS ON:OFF Default: **OFF**

This command controls how the TNC displays certain messages in command and CONVERSE modes. The messages affected are described below:

MESSAGE	EFFECT WHEN BBSMSGS ON
***CONNECTED to xxxx	-A newline is added just before"***"
***DISCONNECTED	- " "
***retry limit exceeded	- " "
***xxxx Busy	- " "
***FRMR sent	- " "
***FRMR rcvd	- " "

***Connect request:xxxx-This message is omitted.

The **BBS**MSGS command is primarily useful for host operation. Primarily with WORLI and like bulletin board systems that require link status messages to begin in the first output column.

The connect request message is omitted during **BBS**MSGS mode. This should be most useful for preventing corruption of messages when forwarding with small frames.

TXTMO: Counter Default: 0

TXTMO is a new addition to the TNC health-group. This register may accumulate counts as the TNC successfully recovers from HDLC transmitter timeouts. This is not a useful command for the majority of the users.

RELEASE 1.2.6 NOTES

ENHANCEMENTS

1. **KISS** enables the MFJ-1270B/1274 to act as a modem for a host computer. Turning **KISS** on allows the MFJ-1270B and MFJ-1274 to run programs such as TCP/IP, MSYS and other programs which used the Serial Link Interface Protocol (SLIP).

2. **Weather FAX** reception is now possible for users who use IBM and compatibles, Macintosh or Commodore C64/128 computers. With these computer, to receive weather FAX you must use the MFJ-1287B starter pack for the Macintosh computer, the MFJ-1284/1289 starter pack for the IBM and compatibles or the MFJ-1282 for commodore C64/128.

3. The **MNonax25** command is installed. When this command is turned ON, the display of non-AX.25 packets is inhibited.

KISS Command Operation

KISS ON|OFF Default: off

Parameters:

ON: Serial Line Interface protocol (SLIP) is used between the TNC and the attached computer. The TNC executes a very limited instruction set, arbitrating channel access only and depending on the computer to handle all Level Two and higher protocol issues.

OFF: The TNC operates using the commands and messages documented herein. This is the normal mode of operation.

This command is used to enter the "KISS" mode for operation with various experimental protocols. **KISS** is used with intelligent host computers. The most popular use has been in conjunction with the KA9Q TCP/IP networking software.

To operate **KISS**, enter the command **KISS ON**, then the command **RESTART** (NOT RESET!). The CON and STA LEDs will flash three times when initially activated. This command will then have effect for subsequent power on/off cycles.

Before enabling KISS, make sure radio baud rate and terminal baud rate are set to the desired values. The terminal's baud rate that's determined at sign on is the same that will be used for KISS. Once the operating terminal parameters have been selected you may enter KISS mode operation. If you are using the KA9Q TCP/IP software package, to return to normal AX.25 operation, issue the command:

param ax0 255

Note that this command must be issued under the TCP/IP "net>" prompt and lower case letters must be used.
Once the TNC-2 receives the "param ax0 255" command, turns KISS off and will revert back to ordinary AX.25 mode of operation. When the TNC-2 is powered on again, it will sign on to the AX.25 operation mode.

If you are not using the TCP/IP software package, you will need to send the three bytes $C0, $FF, $C0 to the TNC-2 to restore normal operation. If you cannot send these character values with the software you intend to use, you must power the TNC-2 off, then disconnect the bbRAM battery by removing JMP 5 on the TNC-2 main board for several minutes, then reconnect the battery and power up again to restore normal operation. The commands available in KISS mode are:

Command	Function	Comments
0	Data Frame	The rest of the frame is data to be sent.
1	TXDELAY	The next byte is the transmitter keyup time in 10 mSec units, with a default of 50 (500 mSec).
2	P	The next byte is the persistence parameter, p, scaled to the range 0- 255. The probability of transmitting at the next opportunity is p/255. The default is 64 (for a probability of 0.25).
3	Slot Time	The next byte is the slot interval in 20 mSec increments. The default is 10 (100 mSec).
4	TXtail	The next byte is the time to hold the transmitter after the FCS as been sent, in 10 mSec units. The command is obsolete and is included for completeness with earlier implementations.
5	FullDuplex	The next byte is 0 for half-duplex (normal) or any other number for full duplex (e.g., for operation with MicroStas).
FFReturn		Exit KISS and resume normal TNC operation.

Note: The TNC will only return type 0 frames (received information). Thus, the computer cannot interrogate the TNC to find the values of the other command types.

Weather FAX Operation

To receive Weather FAX with the TNC 2 you will need to have software for your computer to receive the picture and print it on the computer screen or to save the pictures to disk. The MFJ-1284 or MFJ-1289 Starter Pack for the IBM and compatibles computer, MFJ-1287 for the Macintosh or the MFJ-1282 for Commodore C64/128 allows you to print Weather FAX pictures to screen in near real time and to save Weather FAX pictures to disk. Weather FAX pictures saved on disk can be sent to your printer, or recalled to screen at any time. The TNC-2 FAX mode can receive FAX pictures transmitted in the 120 line per minute (2 line/sec) format such as Weather FAX. Weather FAX are received by the TNC 2 in

the 2-level format. Multi-gray levels FAX and other FAX formats are not supported by the TNC-2.

FAX Frequencies

Weather FAX transmitting stations are usually found on the HF bands. Weather FAX stations are generally upper sideband. Some of these stations maintain a regular schedule. The frequencies of some Weather FAX stations are:

3,357.00 4,268.00 4,975.00 6,946.00 10,865.00 12,125.00 20,015

Other FAX Frequencies and the station location are listed in the following chart. These frequencies were obtained from Popular Communications Magazine:

FREQUENCIES (KHz, USB)	LOCATIONS
4,271.00 9,890.00 13,510.00	Halifax, Canada
8,502.00 12,750.00	Boston, MA
9,389.50 11,035.00	Brentwood, NY
4,793.50 10,185.00 12,201.00 14,671.50	Washington, DC
9,157.50 17,447.50	Mobile, AL
8,080.00 10,854.00 16,410.00	Norfolk, VA
4,802.50 9,440.00 13,862.50	Hawaii
7,770.00 11,090.00 13,627.50	Hawaii
8,459.00	Alaska
4,346.00 8,682.00 12,730.00 17,151.20	San Francisco, CA
8,646.00 17,410.50	San Diego, CA

Receiving Weather FAX

Connect an HF Radio to the TNC 2 as described in the Radio connection of the TNC 2 instruction manual. Set-up the TNC 2 for VHF operation.

From the cmd: command mode, the TNC 2 can be set to Weather FAX mode by typing:

FAX <CR>

At this point you will want to set your computer program to start printing the Weather FAX picture on the screen. Do this according to the instruction manual supplied with the software.

Once the program is properly set, set the audio output of your radio to normal volume. Tune your radio to a desired frequency. If you are not familiar with recognizing FAX signals, you may want to select one of the weather FAX frequencies listed above. Weather FAX is usually transmitted at 120 lines per

minute. This is a horizontal scanning rate of 2 lines per second. So by listening to the scanning rate, you can determine if the TNC 2 is capable of receiving that particular FAX signal.

After tuning in the desired FAX frequency, tune the radio so that the DCD LED remains lit. Now observe the TUNING INDICATOR of the TNC 2 while fine tuning your radio (for TNC 2 with tuning indicator only). You will notice that with each scan the tuning indicator will move toward the center. Tune the radio so that the tuning indicator is centered at the end of each FAX scan. Once you achieve this, the FAX signal is tuned in and the TNC 2 is ready to decode the FAX signal.

Proper tuning of the FAX signal is very important for successful Weather FAX receiving. Therefore, if your TNC 2 does not have a tuning indicator you may find tuning difficult. An add-on tuning indicator is available from MFJ Enterprises, Inc. for the TNC 2. Model number is MFJ-1273.

Once entering the Weather FAX mode, the TNC 2 is in standby- receive mode. This means that the TNC 2 is listening to the radio for the distinctive "tic-tic" that indicates the synchronization period at the beginning of a picture. If the TNC 2 hears the "tic-tic" well enough, it will establish a lock to the signal and start printing to the screen.

The TNC 2's built-in LOCK detects the beginning of each picture before starting to print. This insures each picture will be printed from top to bottom. If you want the printer to start to print in the middle of the picture, you may force a lock on the picture and the printer will begin to print upon the "force lock". To force a lock, you simply type the letter "L" while in the FAX standby-receive mode.

If the FAX picture appears to be printed shifted to the right, you can type the "<" key to shift the picture to the left. Each repetition of the "<" key will shift the picture 1/10" to the left. To shift the picture to the right, use the ">" key. Each repetition of the ">" key will shift the picture to the right 1/10". For example, if you needed to shift the picture to the left 1 inch, you would press the "<" key ten times. The picture can be shifted to the right or left at any time during printing.

If the picture appears to be printing diagonally to the left or to the right, this indicates that the master CPU clock on the TNC 2 may not be in frequency with the transmitting signal. To correct this problem, you will need to remove the cover of the TNC 2 and adjust the capacitor trimmer, C47. This adjustment does not require any special equipment. Simply adjust C47 about 1/8 of a rotation at a time and let the printer print a few lines of the FAX picture. If the picture seems to be getting worse, rotate the trimmer in the opposite direction. Repeat this procedure until the picture is straight vertically.

Weather FAX pictures received can also be saved to the disk. This operation is described in the software documentation of your computer program.

Terminating FAX Printing

Printing of a FAX picture can be terminated at any time during the printing. You must type a CTRL-C twice (CTRL-C, CTRL-C) in order to terminate FAX printing. The TNC 2 will return to command mode, and printing will stop.

NEW COMMANDS FOR 1.2.6

MNonax25 ON:OFF default: OFF

MNonax25 is defaulted to OFF. When **MNonx25** is OFF the display of non-AX.25 packets is inhibited. TNC 2 will display only AX.25 packets. Setting **MNonax25** ON will cause TNC 2 to also monitor non-AX.25 packets, for example those associated with TCP/IP and NET/ROM or TheNet links. Display of non-AX.25 packets may not be understandable to the user.

RELEASE 1.2.7 NOTES

In Firmware Release 1.2.7 the packet anti-collision features, **ACKNOWLEDGMENT PRIORITY and SLOTTING** is installed.

These features minimizes packet collisions in a busy channel. Use of the optional SLOTTING and ACKNOWLEDGMENT PRIORITY procedures now in the MFJ TNC firmware significantly improve the reliability of packet radio connections on shared channels. The greatest improvement is yielded when all stations in a network are so equipped and configured with the appropriate, matching parameters.

THE IDEA

The idea behind the prioritized acknowledgment (PriACK) protocol is quite simple. Acknowledgments (ACKs) get priority access to the channel so that time is not wasted retiring packets that have already been correctly copied by the remote TNC. In normal AX.25 practice, for a variety of reasons, the ACK is often not received within the time limit defined by the FRANK (T1) protocol timer.

In fact, because "channel access" methods are not clearly defined in the AX.25 Level Two Version 2.0 protocol document, the present protocol is more likely to synchronize collisions with acknowledgment packets than with any other type of packet!

THE PROBLEM

When a channel becomes clear, if your TNC has something to send, it will immediately send it. Unfortunately, if anyone else's TNC has something to send, it will also "jump on" the channel as soon as it becomes clear. The result is collisions and retries. Only after a collision does the present protocol suggest using random backoff. Thus, an acknowledgment to a just-received packet is almost assured of a collision-and-retry sequence, even though the TNC correctly received the packet. This will usually cause the TNC which is awaiting the ACK to time out and re-send the data.

To this collision synchronization mechanism, AX.25 Level Two Version 2.0 adds a propensity to cause even ACKs which are not from hidden terminals, and thus less susceptible to collision, to be delayed beyond even generous FRANK timer settings when the channel gets busy.
Once FRACK times out, even if the ACK finally makes it through before the retry is sent, the original packet is retried anyway. This wastes a lot of time which could be better used clearing the channel of some of the legitimate offered load.
This feature of AX.25 Level Two protocol accounts for much of the abysmal performance of the currently popular NETROM and TheNet nodes when used with omindirectional antennas systems.

HOW IT WORKS

PriACK protocol avoids the above problems by giving ACKs priority access to the channel. It does this in such a way that even ACKs coming from hidden terminals are usually protected from collision.

Standard AX.25 protocol gives a limited version of this priority access only to digipeated frames through the DWAIT timer.

Ack prioritization works with slotted channel access in the following way:

1. Response frames (ACKs) are always sent immediately upon receipt of a valid packet. Ultimately, not even DCD will be checked for sending an ACK. However, in this release DCD will still hold an ACK off the channel.

2. Stations queued up to access the channel but waiting for a channel busy condition (DCD true) to clear, will start a slotted access procedure only after enough time for a response frame to clear the channel has transpired (ACKTIME). This is true even if the TNC waiting to use the channel cannot hear the ACK being sent.

3. Slot time windows (DEADTIME) are set large enough to ensure the local TNC will be able to accurately determine if another detectable station has started transmitting in any slot proceeding the slot selected by the local TNC. This prevents two TNCs which have selected adjacent slots from colliding.

As you can see. under this protocol there will never be a condition when an ACK is delayed from being sent beyond the FRACK timer limitation. However, the FRACK timer is still active and must be sent to a value that is long enough to allow time for (MAXFRAME*PACLEN) + ACKWAIT to expire before FRACK does. This time will depend on the radio and radio channel data rate is use. The TNC knows that if it doesn't see the ACK immediately when expected, it is probably never going to see it. (See discussion of new parameters below for definition of ACKWAIT.)

Forcing a channel access delay for all stations on the channel which are waiting for a chance to transmit allow ACKs from hidden terminals to get back to the expecting station. This clears that traffic from the offered channel load. If the packet was indeed copied and ACKed, further retries of the same information will not be necessary.

NEW PARAMETERS

There are several new parameters needed for PriACK operation. See the command description elsewhere in this document for their meanings and settings.

1. ACKPRIOR
2. DEADTIME
3. ACKTIME
4. SLOTS
5. ACKWAIT (not directly user settable)

This timer actually consists of the same of ACKTIME + DEADTIME. It represents the time the queued up TNC will wait before transmitting if it has selected the first slot. This allows time for a hidden station's ACK to be sent on the channel.

It is split into two timers because it has two unrelated components. One is related only to the data rate being used on the channel (ACKTIME). the other is related only to the absolute time the radios and TNC DCD circuits require to determine that a transmitter is active after PTT is asserted (DEADTIME).

OTHER RELATED PARAMETERS

Several of the "standard" TNC parameters will affect PriACK operation. Most of theses are parameters in TNCs on the channel which are not using PriACK.

FRACK

FRACK must be set correctly in any TNC regardless of protocol.

FRACK should be set to a value which allows time for the TNC to send its packet and receive the ACK. This value will depend on the settings being used for PACLEN and the radio port data rate. This is because, in many TNCs, the FRACK timer starts at the beginning of the packet rather than at the end! Thus, it is best to set FRACK to its worst case value for whatever data rate you are using on the radio port and still allow for MAXFRAME 7 PACLEN 255 packets to be sent and allow other non-PriACK stations to collide. This way you can make adjustments to PACLEN without having to worry about interaction with the setting of FRACK.

FRACK should be set to 8 for 1200 baud work and 16 for 300 baud operation.

RESPTIME

If you are running PriACK on a channel where some of the stations have long RESPTIME delays, those stations will not be able to successfully communicate with you after connecting. If you wish to communicate with these stations you will have to set your FRACK timer to a number which is longer than the other stations RESPTIME delay.

RESPTIME should be set to 0 in your TNC when running PriACK. With proper DCD operation, RESPTIME 0 will work in any event.

DWAIT

DWAIT is ignored when running PriACK. However, when PriACK is OFF, or if you are using a TNC which does not yet have PriACK capability, DWAIT should be set to DEADTIME, or 33 (330 mSec) for the default.

TXDELAY

TXDELAY should be set to allow for the slowest radio on the channel. It should be the same as DEADTIME and DWAIT. The default of 33 (330 mSec) is adequate for most work.

INITIAL PARAMETER SETTING SUMMARY

The setting for use at 1200 baud on a VHF FM channel are:

ACKPRIOR	ON	
SLOT	3	
DEADTIME	33	
ACKTIME	14	
RESPTIME	0	(if you require a non zero value for this parameter in order to prevent ACKing individual packet in a MAXFRAME greater than 1 blast, you DCD circuit is not working. Please get it fixed)
DWAIT	33	
MAXFRAME	1-7	depending on channel quality
FRACK	8	

The settings to use for 300 baud work on a linear mode HF channel are:

ACKPRIOR	ON
SLOTS	3
DEADTIME	8
ACKTIME	52
ACKTIME	8
RESPTIME	0
MAXFRAME	1
FRACK	16
PACLEN	32 to 128 depending on channel quality WHAT to EXPECT

This modification to the protocol is compatible with stations using the current protocol in the following respect. A station using the new protocol will not degrade the channel for users of the current protocol. So there is nothing wrong with firing up the new stuff on a channel where the majority of the users aren't yet using it. You will be able to communicate with users of the other system without difficulties.

However, if the users of the old channel access procedures have DWait and RESPtime set to 0, they will tend to hog the channel from users of the newer, more polite access system.

Therefore, for purposes of testing the effect of the new system on channel throughput, if there are stations on channel which are NOT using the new system, they should set their DWait value to one that is compatible with the new system users. A reasonable DWait setting for 1200 baud use would be 73. For 300 baud work, it would be 76.

While these settings seem extremely long, they will assure that the stations NOT using the new protocol always get a shot at slot #1. With these settings, the users of the NEW protocol will occasionally capture the channel.

Settings of 43 for 1200 baud and 64 for 300 baud could be used to assure that stations NOT using the new protocol always have a shot at slot #0. This will result in users of the new protocol almost never being able to capture the channel unless all traffic from users of the old protocol has been cleared. This should NOT be done unless ALL stations are using some type of slotted channel access procedure with compatible numbers of slots and compatible slot times.

Remember that the objective of the new channel access procedures is to increase aggregate throughput for the CHANNEL, not necessarily for an individual user. It may seem to you at first when you get on a very busy channel where you are the only station that is using the new system, that you aren't getting to transmit very frequently. This is because you aren't getting to transmit very frequently. However, the OTHER users on the channel will see an incremental increase in the overall amount of data that the channel can pass per unit time because you are being such a nice guy. Remember that transmitting isn't necessarily communicating.

There is ONE benefit that you should be able to see even under the above circumstances. If you are communicating with another station who is also running the new system, the channel should appear more reliable to you even if quite slow. You should not be getting retried out waiting for his ACK to come back & have to keep reconnecting.

As a higher and higher percentage of the users on the channel begin using the new system, the performance of the channel should increase quite a bit. However, we all must remember that if a channel is mathematically capable of transferring (for example) 1000 characters per unit time, the very best it can possibly do (if CSMA is working right) is reliably pass about 620 characters per unit time. If it is offered more than this to handle, performance falls off sharply with increased offered load. Currently the typical AX.25 simplex channels observed on the HAM bands tend to hover around 10 to as high as 18 percent throughput. This is far below the 62 percent that is possible when the protocol is working right.

NEW COMMANDS FOR RELEASE 1.2.7

ACKPRIOR ON|OFF Default: ON

Parameters:

ON Enables Prioritized acknowledgments

OFF Acknowledgments have the same priority as any other frames on the channel.

When **ACKPRIOR** is ON, acknowledgments have priority. This means that is your TNC receives a frame that it must acknowledge (ACK), it will immediately send the ACK if the channel is clear. If other stations are running with **ACKPRIOR ON**, they will not access the channel until you have had a chance to send the ACK, even if they cannot hear your transmissions.

When OFF, acknowledgments are queued up for transmission the same as any other frame.

ACKTIME n Default: 14

Parameters:

n 0-250 in 10 mSec increments.

ACKTIME specifies the time required to send an RR or RNR response frame (an acknowledgment) to an I frame at the radio port data rate. This corresponds to about 510 mSec at 1200 bps with 8 digipeaters and about 140 mSec at 1200 bps with no digipeaters. The default of 140 mSec (ACK 14) allows for no digipeaters.

CHECKV1 ON|OFF Default: OFF

Parameters:

ON Enables CHECKtime (T3) when running AX.25 Level 2 Version 1.0 protocol. This will result in an automatic disconnect when packets haven't flowed between this TNC and the remote TNC for CHECKtime. See CHECK command.

OFF Disables the CHECKtime timer (T3) and requires the operator t initiate a disconnect sequence. This is in accordance with AX.25 Level 2 Version 1.0 procedures.

When ON, the CHECK (T3) timer is used to automatically disconnect an AX.25 Level 2 Version 1.0 link when data hasn't flowed for CHECK time. Note that T3 is not defined for Version 1.0 operation. See CHECK command.

When OFF, T3 is ignored and normal Version 1.0 procedures apply.

Note:	Many operators prefer suing Version 1.0 protocol, especially on marginal or noisy links in order to eliminate some of the overhead of AX.25 Level 2 Version 2.0 protocol.

DEADTIME n Default: 33

Parameters:

n 0-250 in 10 mSec increments.

DEADTIME specifies the time it takes a station's receiver to detect the fact that a remote transmitter has keyed up. It should be set to the time of the slowest acceptable radio on the channel. It must also allow for any squelch delays and DCD lock time. **DWAIT** and **TXDELAY** should also be set to this same value for everyone in the LAN.

A fairly fast VHF FM radio-plus-TNC might take 210 mSec (DEA 21), while an HF radio-plus-TNC will usually respond in 80 mSec (DEA 8). Some multi-mode radio-plus-TNCs operating at 1200 bps may respond in only 40 mSec (DEA 4). The default value (DEA 33) will safely cover the majority of FM radios in common packet use.

FIRMRNR ON|OFF Default: OFF

Parameters:

ON When the MFJ TNC-2's buffer is fill, an RNR is sent. When the buffers are no longer full, an RR command frame is sent.

When the MFJ TNC-2 receives an RNR, it will not poll the sending TNC until {T0*10 seconds}. T0 = CHECKtime*8 unless CHECKtim*8 is <30 or >253 in which case T0 = 12.

OFF When the MFJ TNC-2's buffers fill, an RNR is sent as a response to an I frame.

When the MFJ TNC-2 receives an RNR, it will resend the data every FRACKtime (T1) until an RR is received.

When OFF, standard AX.25 Level 2 Version 2.0 protocol procedures are used. If a TNC sending data receives an RNR, meaning the remote TNC cannot accept more data, The sending TNC (MFJ TNC-2) will continuously re-send the data every T1 (FRANK) time until an RR is received, meaning the remote TNC accepted the data. This often results in a lot of unnecessary channel congestion.

When **FIRMRNR** is ON, the MFJ TNC-2 will stop sending data upon receipt of an RNR. If the remote TNC does not send an RR before [T0] (see above), the MFJ TNC-2 will poll the remote TNC to be sure it is still active. If the MFJ TNC-2 sent the RNR, then it will send an R when its buffers have cleared to allow more data to be received.

Note:	The remote TNC should be capable of **FIRMRNR** operation. This mode is operable with all TNC's having a **FIRMRNR** settable to ON, and with most network nodes. If the remote TNC is not capable of **FIRMRNR** operation, and if the channel is poor, there will be additional delays in getting data passed between the TNCs.

FIRMRNR controls the handling of busy states by the MFJ TNC- 2. Setting FIRMRNR ON improves channel efficiency, but is incompatible with earlier TNC-2 releases. The incompatibility is a result of vague protocol specifications.

FIRMRNR should be always be set ON when conversing with network nodes, for example, NET/ROM. In other cases, it is recommended that FIRMRNR be left OFF unless you can be assured the other TNC you are connected to supports FIRMRNR.

SLOTS n Default: 3

Parameter:

n 0-127

SLOTS specifies the number of "slots" from which to choose when deciding to access the channel. For example, SLOTS 3 means there are three slots, each having a probability of 1/3 to be selected. Each slot is **DEADTIME** long. If **SLOTS** 0 is chosen, the TNC will act as if **SLOTS 1** had been selected.

Other implementations of this idea of channel access use "PERSISTENCE" to decide the probability of channel access when the channel is clear and "PPERSISTENCE" to enable or disable this feature.

A low value means a greater chance of attempting to send data when the channel is clear, and a higher value means less chance. Normal AX.25 practice is to have every station jump on the channel when it goes clear, virtually assuring collisions and re-tries.

SLOTS and its relation to the more common "PPERSISTENCE" and "PERSISTENCE" commands are given below:

SLOTS	PPERSISTENCE	PERSISTENCE	PROBABILITY TO XMIT	
1	OFF	255	Jump on	= 100%
2	ON	127	Jump on	= 50%
3	ON	85	Jump on	= 33%
4	ON	63	Jump on	= 25%
5	ON	51	Jump on	= 20%

and so forth.

A typical value would be 2 or 3 for a channel with a few other users and 5 to 7 for a fairly busy channel. Higher values than about 10 imply the channel is too busy and other frequencies should be used if available.

Note: **SLOTS** is independent of **ACKPRIOR**.

STATUS

STATUS is an immediate command. It returns the acknowledged status of the current outgoing packet link buffer. If all outgoing packets are acknowledged, **STATUS** returns 'No Outstanding packets', otherwise it returns the 'Outstanding packets' message. Note that this command works independently of the RS-232 flow-control state of the TNC.

This command may be useful for special applications, like if you can't see the STATUS LED on the TNC, or you want your computer to watch the status...

TXDELAYC n

Default: 2

Parameter:

n 0-120 specifying additional transmit delay time added to TXdelay in terms of **CHARACTER TIME** at the current radio port data rate.

Flags will be sent during this time, so a value of 1 is required as a minimum.

TXDELAYC is used to fine-tune transmit delay after a transmit command is issued and before data is sent. Used in conjunction with **TXDELAY**, it allows a link to be set for maximum performance.

TXDELAY should be used to account for the time it takes the radio (the slower of the MFJ TNC-2's radio and the remote TNC's radio) to switch between receive and transmit and allow the receiving unit's data carrier detect (DCD) circuitry to respond. "0" bytes are sent to allow the remote TNC to synchronize to the data stream sent during **TXDELAY.**

TXDELAYC then sends flags to start the frame. if **TXDELAYC 0** is selected, the MFJ TNC-2 will act as if **TXDELAYC 1** had been chosen.

With the method of keying up, a user may operate at various HDLC data rates without having to reset **TXDELAY** if the same radios are used. The summation of **TXDELAY** and **TXDELAYC** will automatically adjust the keyup time for the varying rates.

TXDIDDLE ON|OFF

Default: ON

TXDIDDLE determines whether or not the MFJ TNC uses a highly efficient square wave signal in place of flags during the transmitter delay (TXDELAY) period. When **TXDIDDLE** is ON, you may select even smaller TXDELAY intervals because the square wave presents four times as many transitions as **TXDIDDLE** OFF does for your connectees' receive synchronization.

TXDIDDLE is defaulted to the ON setting to reflect the increased efficiency. However there are a number of TNCs on the market which purport to be AX.25 compatible but do not recognize valid AX.25 packets preceded by the TXDIDDLE keyup technique. You may recognize the need to set **TXDIDDLE** OFF if it appears that the station you're working is unable to successfully receive your packets despite your adequate signal.

This failure of some TNCs to receive TXDIDDLEd packets may be a result of some software carrier-detect schemes. All TAPR and derivative TNCs utilizing hardware-generated carrier-detect receive both TXDIDDLEd and non-TXDIDDLEd packets with equal efficiency.

Note that when **TXDIDDLE** is OFF, TXDELAYC is irrelevant! Therefore, the actual TXDELAY yielded when TXDIDDLE is OFF is equal to TXDELAY*100ms plus any AXDELAY time.

TXUIFRAM ON|OFF Default: OFF

Parameters:

ON The TNC will "flush its buffers" to the radio port upon loss of a connection.

OFF The TNC will only send BEACON and ID frames as unconnected (U1) frames. It will discard information in its buffers upon loss of a connection. connection.

This command determines whether the TNC will transmit most unconnected information packets.

Setting **TXUIFRAM** OFF will prevent all but BEACON and ID unconnected ("UI") frames from being originated and transmitted. This is most useful for BBS and other stations which tend to leave unacknowledged data in the TNC transmit buffer when a connection is lost. The normal behavior of a TNC would send the buffered data as "UI" frames, adding to channel congestion.

The behavior with **TXUI**frme OFF serves to reduce channel congestion because the non-useless data is never sent.

Note: TXUIFRAM has no effect on the digipeating of UI frames. It only affects frames being originated at this station.

RELEASE 1.2.8 NOTES

In firmware Release 1.2.8 the **Host Mode** feature and the **QRA** ("Who are you") command are installed.

Host Mode requires a special terminal program to operate. Documentation for Host Mode is available on disk from MFJ upon request.

QRA ("Who are you") pinging is supported in release 1.2.8. A QRA ping polls all of the TNCs within range. A random number of seconds later, each TNC that heard the QRA ping will transmit its identification packet. The purpose of this feature is to reveal to the packeteer, particularly the transient one, the names of all reachable TNCs and digipeaters.

Sending a QRA ping:

1) Set the unprotocol callsign to QRA
   cmd: UNPROTO QRA<cr>

2) Manually send an unconnected packet

   cmd: CONVERSE<cr>
   <cr>
   ^C
   cmd:

NEW COMMANDS FOR 1.2.8

ANSWRQRA ON|OFF Default: ON

Parameters:

ON MFJ TNC responds to non-digipeated UI frames addressed to QRA, within 1 to 16 seconds, with an empty ID packet.

OFF Disables MFJ TNC's ping-response function.

QRA ("Who are you") pinging is supported in firmware release 1.2.9 of your MFJ TNC. A QRA ping polls all of the TNCs within range. A random number of seconds later, each TNC that heard the QRA ping will transmit its identification packet. The purpose of this feature is to reveal to the packeteer, particularly the transient one, the names of all reachable TNCs and digipeaters.

Sending a QRA ping:

1) Set the unprotocol callsign to QRA

cmd: UNPROTO QRA<cr>

2) Manually send an unconnected packet

cmd: CONVERSE<cr>
<cr>
^C
cmd:

This sequence will send an unconnected packet. Once the local TNCs have responded with ID packets, then the user can press a "CRTL-C". The MFJ TNC will respond with the cmd: prompt.

MNONPrin **ON|OFF** default: ON

Parameters:

ON Enables printing Non-Printable Characters

OFF Discards all Packets containing Non-Printable Characters

The setting of the MNONPRINT parameter determines whether monitored packets containing non-printable characters (i.e., characters other than ASCII CR, LF, BEL, and not between $20 and $7e) are monitored or simply discarded. The default setting permits monitoring all information packets (subject to LCALLS, MONITOR, MNONAX25, etc). When MNONPRIN is OFF, information packets containing one or more non-printable characters are discarded. You may find this command helpful when there are binary transfers on the channel that you'd rather not monitor. MNONPRIN has no effect on data received during connections.

RELEASE 1.2.9 NOTES

ENHANCEMENTS

In firmware Release 1.2.9 major improvements have been made in the Easy-mail mailbox. The improved mailbox features can be used in the MFJ TNC2 with or without the mailbox memory expansion. However, in order for you to fully benefit from this mailbox, we recommend that you install the memory expansion board. The on-board MFJ TNC mailbox memory is approximately 8K. Additional mailbox memory on your MFJ TNC can be increased by 32K, 128K or 512K. This additional memory is also battery back-up by the lithium battery on the MFJ TNC2 mother board. The memory expansion board can be purchased separately and it can be easily installed by the user inside the MFJ TNC2. The MFJ TNC2 equipped with the expanded memory must use firmware release "X", (e.g. 1.2.9X) which is supplied when you purchase the memory expansion board. However, you must remember to request the "X" version of firmware upgrade whenever a new upgrade becomes available in the future. The different versions of the mailbox memory boards are listed below:

Item No.	RAM size
MFJ-47A	32K
MFJ-47B	128K
MFJ-47C	512K

Above mailbox memory expansion boards are available from MFJ dealers or from MFJ Enterprises, Inc.

Set Up your Easy-Mail Mailbox

The Mailbox can now be operated independently from the standard packet operation. There are certain commands which need to be set. These will be explained later in this instruction.

NOTE: Whenever **<CR>** is found in this instruction this means to press the **RETURN** key, not to type **<CR>**.

1. Under the cmd: prompt, type:

   MYMCALL n <CR>; where n is the callsign you wish to for your mailbox.

2. Type:

   USERS 1 <CR>

3. If you want your messages time and date stamped, then set DAYTIME with the current information. Please refer to your MFJ TNC main manual, as to how to set the DAYTIME parameter.

Note: An optional TNC real-time clock (MFJ-43) for the MFJ TNC2 is available from MFJ Enterprises. With this real-time clock module installed in your MFJ TNC, the clock will continues to keep time even with the MFJ TNC2 turned off. You will not have to set your MFJ TNCs "DAYTIME" every time your MFJ TNC is powered up.

4. Type:

MAILBOX ON <CR>

Now your MFJ TNC is ready for simultaneous Mailbox/Packet operations. You as the SYSOP can access your Mailbox by typing:

SYSOP <CR>

Your MFJ TNC will respond with:

|K[MFJ-2.0-M$]
Mailbox ready
n free Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

First of all lets find out what the **n free** is for. The **n free** is a "Bytes Free" indicator. This applies only to the Mailbox. This is a great feature, because all users will always know how much space is left in your Mailbox. The Mailbox will update the "Bytes Free" whenever messages are forwarded, added or deleted.

NOTE: The **M** command will not be in Release 1.2.9. This is due to the fact that there is no Mailbox expansion in the Release 1.2.9.

Now you are ready to operate your mailbox. However, lets take first things first. You very well cannot operate the Mailbox without knowing the functions of the commands. So, lets take a look at the functions of the Mailbox commands. The functions are as follows:

B---- Logout: This initiates a disconnect sequence from the Mailbox.

E---- Edit Message Header: This allows editing of the message header. This is necessary for the Forward and Reverse Forward functions of the Mailbox. The current is first displayed, then the Mailbox gets the new values, according to what is entered at the prompts it gives the user. The local and remote SYSOPs may edit any messages in the Mailbox. Remote users may

only messages TO and FROM himself, and any message of Traffic. Below are the edit prompts and an explanation as to what their functions are:

To: The callsign of the person the message is going to goes here. It must be different than MYcall or MYMcall.

@: The callsign of the BBS you wish to Forward the message to is placed here. This BBS should be the one where the person whom you are sending the message to gets his mail.

From: The callsign of the person who originated the message is placed here.

Type: The Type of message you are sending is placed here. This will turn on a flag in the first flag box. There are a few message types, and here are a couple listed below:

1. "T" messages -- These are NTS (National Traffic System) type messages. This message system was developed by the ARRL. These messages must be formatted in a certain way. Please refer to the **ARRL Net Directory** for more detailed view and information on this message system.

2. "P" messages-- These types of messages are still private to the sender, recipient, and the SYSOP.

There are other types of messages supported by the Mailbox but without special features.

Flag: The message Flag is now very important. All of flags can be set via the S (send) or E (edit) commands. This flag will either be an N or a Y. This will appear in the flag block closest to To: block in the message header. There are different types of flags are as follows:

N--- Messages with this flag set are all able to forwarded, providing all other criteria is met for a message to be forwardable). Only messages with the N flag set, trigger the "You have new mail!" message.

T--- The T flag indicates that the message is an NTS message.

Y--- Messages with the Y flag set are eligible to be killed by the "K" global kill command.

F--- This flag is set when a message is forwarded. Messages which are eligible to forwarded are:
1. Messages where the N flag is set.

2. Messages that have no @ addresses that are different from MYMcall.

P--- Messages with this flag set are private to the sender, recipient, and the SYSOP. Only the person to which the message is addressed to can read or kill it. The local or remote SYSOP can read or kill any message in the system.

Here is an example of a Mailbox message with a Type flag and a message flag inserted:

Slot:1 PN To:KB5JNZ From:KF5C BBS Bulletin

The P is in the Type flag block, which indicates that the message is a Private message. The N is in the Message flag block, which tells you that the message has not been read by the callsign KB5JNZ. When KB5JNZ reads the message the N flag will become a Y flag.

H(elp)-- This command displays the Mailbox command list. A brief description of the commands available to user is given.

J---- This command replies with the TNC's MHeard list. The eleven most recently heard callsigns will be displayed. The "J" command only applies to remote users.

K---- Allows you to kill messages which are addressed to you. This works in conjunction with the Y flag. In order to perform a Global Kill, first of all of the messages to be killed during this must have the Y flag set in the header. Secondly, all messages to be killed must have the same callsign as MYMcall.

K##-- Allows you kill the message in slot nn, where nn is a particular slot number. Remote users may only kill messages which are addressed only to them or originated by them. The local and remote SYSOP can kill any messages, depending on the setting of the new command REMsysop. Please refer to the REMsysop for more detailed information.

L---- This command allows the remote user, local or remote SYSOP to list all messages in the mailbox. All of slots which are currently in use will be listed. They all will have the slot number, flag field, the destination callsign, originator callsign, subject field. Also the Mailbox command line will be on the next line.

M---- This allows the remote user, local or remote SYSOP to change memory banks in the mailbox ram. The current memory bank is indicated on the mailbox command line. The bank will be inside a pair of{}, which will be

after the "bytes free" indicator. Below is an example of a typical command line from the mailbox:

nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Where {n} is the bank number. The bank number will vary from 0 to 7 depending on the size of the expanded memory ram. The bank numbers in relation to the RAM size are as follows:

MEMORY SIZE	BANK NUMBER
32K	0
128K	0 or 1
512K	0 thru 7

NOTE: There will be only one (1) number in the { } at anytime.

For example let's say that you are running a 128K mailbox, and a remote user wants to access memory bank #1. First a connection to your mailbox must be made. Once the Mailbox command line is obtained the user will type:

M 0 <CR>

This will be received by your Mailbox and then your Mailbox will send back a new Mailbox command line:

nn free {0} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Thus the {0} indicates the memory bank has been switched to bank #1.

NOTE: The "M" function applies only to an MFJ TNC which have the MFJ-47A,B, or C expansion board installed and Release 1.2.9x is used.

R---- This command lets you read messages addressed to you. When you list the messages in the mailbox you notice an N flag next to the messages which you have not read. Once you read those messages the N flag will change to a Y flag. This is an indicator to both you and the SYSOP that the messages have been read. From there you can perform a global kill on all of your messages or the SYSOP can kill them individually.

NOTE: The only way an N flag can get changed to Y flag during a read is that the person who the message is addressed to needs to read it. The flag will not change for any other person who reads the message.

R##-- Allows you to read the message in slot nn. Where nn is a particular slot number. This command works the same as the R command, except its for reading the individual slots.

S call-- This allows the remote user, local or remote SYSOP to send a message to the designated callsign. "CALL" must be a callsign valid under the same format as the MYCALL, CONNECT or other callsign commands. You can also send messages in NTS (National Traffic System) format. You will need to refer to the ARRL NET DIRECTORY for more detailed information on the NTS system.

SP call- This allows the remote user, local or remote SYSOP to send a personal message to the designated callsign. This is a private message and only the person to whom the message is addressed can read or kill it. The SYSOP can also read the private messages. When a private message is listed a P flag is shown in the "Message Type" flag block. The P flag can also be inserted by the originator or the SYSOP through the Edit command.

T---- This command allows the remote user to page the SYSOP. When the T command is invoked from the remote user the following message appears on the SYSOP's computer screen and it also is sent back to the remote user's screen:

Paging SYSOP; any key aborts...

The Mailbox will page the SYSOP by ringing the SYSOP's terminal bell 30 times. If the SYSOP is at his or her terminal, the asterisk character will appear on the screen every time the terminal bell (CTRL-G) rings. If the SYSOP does not answer the Mailbox will send the message back to the user saying no answer. Below is an example of a typical screen:

Paging SYSOP; any key aborts...
**********************************No answer**

The remote user may abort the SYSOP page by sending packet to the Mailbox. If the SYSOP does answer the page then the SYSOP can enter CHAT command, then converse one-on-one with the remote user.

This concludes the explanation of the commands which are on the Mailbox command line. Now lets get into a little of the Mailbox operation. If you have any questions about the Mailbox commands, we believe they will be answered in this section.

MAILBOX OPERATION

1. First establish a connection to the Mailbox station.

2. If the Mailbox of the station to which you are trying to connect with is ON, then it will answer back with the Mailbox prompt:

   Mailbox Ready

   nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Note:	The **nn free** indicates the amount of RAM space available for messages in the Mailbox to which you are connected to. The nn will be no higher than 65K, if a 512K or a 128K Mailbox is in operation. If the Mailbox is 32K then nn will be 32K.
Also:	The{n} indicates the memory bank being used for the Mailbox. Please refer to the explanation of the M command for the Mailbox, in this section.

Now at this point all of the Mailbox are available to you. You may then type M to switch the memory bank of the Mailbox, K to kill a message, L to list all messages, R to read the messages, S to send a message, B to logout and disconnect from the Mailbox or H for the HELP menu.

3i. To send a message the S or the SP commands must be used. It must be used in conjunction with a callsign as in the examples below:

S KB5JNZ <CR>, this will send an ordinary message to the callsign KB5JNZ.

OR

SP KB5JNZ <CR>, this will send a private message to the callsign KB5JNZ.

a. The Mailbox will respond with:
   Title:
   _

b. The user will enter the message subject (title) at cursor prompt, then press the "RETURN" key.

c. The Mailbox will respond with:
   Send msg; Control-Z or /EX to end:
   _

d. The user will then enter the message at the cursor prompt. If you are using a 512K or 128K Mailbox then you can actually upload disk files into the Mailbox. The 32K version has the same capability but with 32K RAM capacity. At the end of the message press a Control-Z and the RETURN key. The message will be sent.

e. Your message will be seen on the mailbox station's screen, then the mailbox will respond with the mailbox command prompt:

nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Where nn is the "bytes free" indicator. This tells the user how much ram space is available in your Mailbox. Also {n} is the indicator of the current memory bank in use by the Mailbox.

3ii. There are two (2) different ways to kill messages. The first is give in the example below:

1. To kill a message in a particular slot type:

a. K## <CR>
Where the ## is the message number you want to kill.

b. The Mailbox will respond with:

Message ## deleted;
nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

This is whether or not the message flag is set to an N or a Y. Note that the remote users may only kill messages which are addressed them. The originator can also kill the message. The local SYSOP can kill any or all messages in the Mailbox.

2. You can perform a Global Kill on a group of messages which are under the same callsign. To perform this two (2) conditions must be met:

a. All messages must have been read and the message flag must be a Y.

b. The callsign contained in the MYMcall must be the same as the callsign in the MYcall command.

If the above conditions are met then all the user must type:
K <CR>

This will go out to Mailbox, then the messages with the message flags set to Y and all of the proper callsigns will be killed. The Mailbox will

respond back to the remote user with all message numbers killed during the Global Kill process. Also the Mailbox prompt will be given again. The "bytes free" indicator will be updated also. The SYSOP either remote or local can do a Global Kill. The SYSOP must individually kill any messages.

3iii. The remote user or local SYSOP can List messages from the Mailbox. In order to do this first the Mailbox prompt must be obtained by either a connection to the Mailbox or through the local SYSOP command. Then to List messages from the Mailbox:

a. Type:

L <CR>

b. The Mailbox will respond with a list of currently used slots in the following format:

Slot:## To: From: Subject:

Where Slot## column is the number of the slot which the messages are in. The lower case t is the **Type Flag** block. The lower case m is the **Message Flag** block. The To: column will contain the callsign of the person who the message is addressed to. The From: column will contain the callsign of the person who left the message. The Subject: column will contain a brief message title.

Note that the number of slots for an MFJ TNC without memory expansion board is 30. For an MFJ TNC with the memory expansion installed the maximum slots per memory bank is 99.

After the Mailbox lists all messages it will issue the Mailbox prompt:

nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

3iv. Anyone who accesses the Mailbox can read messages or which are addressed to him/her. Also a message which is a addressed to ALL, such as bulletins can be read by anyone. Messages can be read by two (2) different methods. Below are the two methods:

a. This method will allow the remote user, local or remote SYSOP to read a group of messages. This is only good for a group of messages with the same callsign as MYcall. The set conditions of the Type or message flags have an effect on a read process. They can be set to an N, Y or an F. To perform this type:

R <CR>

b. Messages can also be read individually by the slot number. This is good for reading other messages like bulletins or messages addressed to ALL. In order do an individual read type:

R## <CR>

Where ## is the slot number of the message that you wish to read.

The Mailbox will respond with the message from the slot specified.

All messages read will be in the following format:

Slot## To: From: Subject:
This is an example of a message from the Mailbox

Where Slot## column is the number of the slot which the messages are in. The lower case t is the **Type Flag** block. The lower case m is the **Message Flag** block. The To: column will contain the callsign of the person who the message is addressed to. The From: column will contain the callsign of the person who left the message. The Subject: column will contain a brief message title.

Then at the end of the message the Mailbox prompt will be issued.

3v. The remote user can also disconnect from the Mailbox without having to issue a CTRL-C, D and a RETURN. All that needs to be done is to type: **B** to logout of the Mailbox and disconnect from the it. If you access your Mailbox via the SYsop command, then you must issue a CTRL-C to exit the Mailbox and return to command mode. The command prompt will indicate the stream you are on. The command prompt may look like this:

|Acmd: where |A indicates that you are on packet stream A.

This is the only way the remote users can access your Mailbox. If you stay in the SYSop mode then when a user tries to connect to your Mailbox he will a message like this:

*****CALLSIGN Busy**
Disconnected

The SYSOP will receive a message like the example below when he is in the SYSOP mode and someone tries a connect:

*****connect request:CALLSIGN**

NEW MAILBOX FEATURES

Other MFJ TNC mailbox features are as follows:

Forwarding:

The MFJ TNC Mailbox now has the ability to Forward mail to most full service and personal mailboxes. This feature allows you to compose your mail on your TNC, at your leisure, and then Forward the resulting messages for eventual delivery.

Messages may be forwarded any one of three ways either manually, by command, or by automatic forward. You can either forward messages hourly, or by your local full-service mailbox's reverse forward request.

Manual and hourly forwards may proceed through up to eight (8) digipeaters, allowing the messages to be forwarded through ROSE switches. Also NODE forwarding is can be done too, thus allowing you to forward mail through NETROM, THENET, and KA- NODE switches. Please refer to the **NOD**eforw command in this manual.

In order to conserve RAM, space the SYSOP may specify that forwarded messages be killed upon successful forwarding. However, if conserving RAM is not a concern, then forwarded messages will be flagged "F". This flag will appear in the message flag block. Messages with F flags will be saved in the mailbox for the SYSOP's disposition.

All forwarding events are monitored on the screen, in order to inform the SYSOP of the forwarding progress.

In order for a message to be eligible for the forwarding process two (2) conditions must be met:

1. Messages must have N flags in the message flag block.

2. All messages must have an @ callsign in the message header.

The command used to forward a message is **FO**. All forwards must be done in the stream cmd:mode. This command is by pressing a CTRL-C while in the SYSOP mode. Below is a typical example as to how to use the FO command:

FO CALLSIGN <CR>

Where CALLSIGN is the callsign of the destination mailbox. This callsign must also reside in header of the message to be forwarded. The message

header can be altered through the Mailbox Edit command. Please refer to the EDIT command in this manual. When the FO CALLSIGN is issued the MFJ TNC will initiate a connect request to the destination BBS. If the connection is successful the your mailbox will proceed to send the message to the destination BBS.

Eliciting Reverse Forwards:

This very unique feature, when combined with the hourly automatic forward, enables the MFJ mailbox to query another BBS, regularly and automatically, for the purpose of polling the other BBS for the TNC user's mail. Thus, even if your local full-service BBS operator is unwilling to forward to you, you can still have most of the benefits of auto-forwarding because your own TNC will elicit your mail for you on an hourly basis.

Reverse forwards may be restricted to a particular callsign. This prevents others users from "stripping" messages off of the mailbox prior to their being forwarded to the legitimate destination.

When all messages are forwarded, if the destination mailbox supports reverse forwarding (as determined by $ in it's SID) then the MFJ TNC will attempt to elicit a reverse forward.

Remote Heard Log:

This handy feature allows the remote user to query the TNC heard log at any time. From this log the remote can determine band conditions, or just see who has been around. The log holds eleven (11) of the most recently stations.

Chat Mode:

The Chat mode feature in the MFJ TNC Mailbox is similar to the standard TNC "converse mode". It enables the SYSOP to break onto a mailbox link, and get one-on-one with mailbox user. This is just like a regular "Packet QSO". This is good for discussing problems maybe with the link or with the mailbox in general. Chat mode terminates any user or forwarding operation in progress. The mailbox will stay in Chat mode until the SYSOP returns to command mode.

Page SYSOP:

This allows the remote user to "Page" the SYSOP by ringing the SYSOP's terminal bell. This is done by the SYSOP's mailbox sending a CTRL-G to the SYSOP's terminal. The SYSOP's mailbox will poll the terminal's bell 30 times. If the SYSOP does not answer the remote user will receive a message back saying No Answer. If the SYSOP does answer then he can go into the Chat mode, and converse with the remote user. For more detailed

information on this feature please refer to the section on Mailbox Set Up in this manual.

Remote SYSOP:

The Mailbox has the capability to be remotely controlled. A callsign can be specified by the SYSOP for this purpose. This would be useful in the case where the SYSOP is out in the field. It would allow him to control the mailbox, and do most of the local SYSOP's duties, such as killing messages, reading, editing message headers for forwarding purposes.

Mailbox CText:

This is a message dedicated to the Mailbox, but is used when a connect is made to the MYMcall callsign. It is limited to 120 characters in length. If MCText is empty, then no message will be sent.

Idle Timeout:

The Mailbox incorporates an idle timeout function. This is to ensure that the mailbox is still accessible in the event of a remote user drop out during a connection or walks away from the TNC for too long. The Mailbox will automatically do a disconnect from the link after the time which the SYSOP specifies.

Abort:

This command gives the SYSOP control over the mailbox by allowing him to force a disconnect on the mailbox link. It may also be used to avoid any QRM, to abort a forward-in-progress. You can also use it to terminate mailbox usage by an unwelcome user.

The new Mailbox system is fully compatible with NTS packet messages also. It allows you to format NTS type messages, and send them to another destination.

The MFJ TNC also incorporates a new "bytes free" counter. It is updated as the mailbox fills or empties. In the case of the MFJ-47B and MFJ-47C (128K and 512K respectively) it keeps up with the available RAM in multiple memory banks.

NEW MAILBOX COMMANDS

MYMcall **[callsign]** default: blank

This is the dedicated callsign for the mailbox. If MYMCALL equals MYCALL, the TNC responds to incoming connections in mailbox mode. When there is no callsign put in MMcall, the mailbox is inaccessible to remote users.

FOrward (dest bbs,[optional via]) Mode: Packet

FOrward is an immediate command. Messages can be forwarded manually, by command, or automatically. They can also be forwarded hourly or by your local full-service mailbox reverse forward request. When invoked the mailbox initiates a connect to the callsign of the destination BBS. When a connect is established the mailbox will proceed to send your messages. Messages that qualify for forwarding must meet two conditions, they are:

1. Have flags of 'N'ot read
2. Must have a callsign in the @ addresses that are different from MYMCALL.

After forwarding, each message's flag is set to 'F' to prevent further forwards. When all messages are forwarded, if the dest bbs supports reverse forwarding (as determined by "$" in its SID) then TNC will attempt to elicit a reverse forward.
For more information on Forwarding and Reverse Forwarding can be found in the Mailbox Features section of this manual.

MCText Mode: Mailbox Default: " "

Text: Any combination of characters and spaces, up to 120 characters in length.

This command works like CTEXT except that MCTEXT is sent only when the mailbox MYMcall is connected to. There is no express equivalent to the CMSG ON/OFF command. If MCText is empty, no string is sent. If the is message longer than 120 characters an error message will be given and the command is ignored.

The command string can be cleared by typing the command, and then entering the % sign where the text would normally be entered. Also the RESET command will empty the MCText command.

For example you might want to set your MCText to:
Welcome to the Mailbox... I'm not here right, but feel free to use the system...Enjoy!

MTimeout n Mode: Packet Default: 30

Parameters:

n 0 - 250, specifying 10 sec. intervals

If non-zero, this is the timeout value expressed as 10s of seconds. Timeouts on the mailbox apply only to remote users (the SYSOP can never time out). The mailbox will timeout and disconnect after n*10 seconds of mailbox inactivity. Note that the synchronous 10 second clock may cause the timeout to occur as much as 10 seconds before the calculated timeout time. So, if you want to set your Mailbox timeout to 5 minutes then you set the MTimeout command to 30, which would specify a time-out of 300 seconds.

MYHIerad Mode: Mailbox Default: " "

Text Any combination of characters and spaces, up to 60 characters in length.

You may use this parameter to generate a customized "@:" portion of the tagline your TNC will insert in forwarded messages. If MYHIERAD is blank, the default @ portion will read "@:<mymcall>". It is suggested that you insert your hierarchical address, location, and zip/postal code in this parameter. Example: MYHIER for N2WX in Sebastian Florida in the Melbourne LAN at zipcode 32958, using N5AUV as the home bbs, would be entered like this:

cmd:MYHIER N5AUV.#MLBFL.FL.USA.NA [N2WX User/Sebastian] Z:32958

-and the tagline would look like this

"R:920801/1200 @:N5AUV.#MLBFL.FL.USA.NA [N2WX User/Sebastian] Z:32958 #:8"

KILonfwd **ON/OFF** Mode: Mailbox Default: OFF

Parameters:

ON Messages forwarded out of Mailbox will be killed after forwarding process is complete.

FF Default; Messages forwarded out of the Mailbox are not killed after forwarding process is completed.

The setting of KILONFWD determines whether or not the TNC deletes a message after it has been forwarded. If Mailbox RAM space is critical then you might want to

set this command ON. Setting this command to ON, could cause problems, because once a message is killed it cannot be recovered.

NODeforw Mode: Mailbox Default " "

node [via x...], up to 8 vias

This is an immediate command. It is similar to the FORWARD command except that the NODEFORW parameter is the callsign+via path to your NETROM, THENET, or KA node. When your TNC establishes the connection to the 'node', it sends the text in NODEPATH to establish a network link to the receiving BBS.

If all goes well, the forwardee will send its signon string, and forwarding will commence. To detect failure, NODEFORW looks for two strings - "BUSY" and "RETR" - as node connection failure indications. Upon finding "BUSY" or "RETR", the forward attempt is considered failed, and the TNC disconnects from the node. The command can contain the callsign of the "node" and up to 8 vias.

NODEPath Mode: Mailbox Default:" "

Enter the command the TNC will issue to command the node connected by the NODEFORW command to link with the receiving BBS.

Example:

cmd:NODEPATH C KB4VOL
cmd:NODEFORW PSL5

This sequence first connects to the PSL5 node. When connected, the TNC sends the node connect command "C KB4VOL" to establish a link with the receiving bbs, KB4VOL.

ABOrt Mode: Mailbox Immediate command

This command gives the SYSOP total control over the Mailbox by allowing him to force a disconnect on the Mailbox link. It immediately terminates any mailbox activity currently in progress. You may use it to cancel an erroneous FORWARD or NODEFORW command, to eliminate unwelcome mailbox users, or at any other time you wish to terminate the mailbox process.

CHAT Mode: Mailbox Immediate command

The SYSOP may, at any time, break onto the mailbox's connected link. The resulting mode is like the a typical CONVERS mode packet connection. CHAT immediately terminates any user or forwarding operation in progress. At the point when the SYSOP invokes Chat mode, the SYSOP and the connectee are in an actual packet QSO. This is good to discuss problems with the Mailbox or equipment failure. CHAT mode continues until the SYSOP returns to command mode.

REMsysop **call[-n]** Mode: Mailbox Default: Blank

Parameters:

Call **Callsign** to be used for Remote SYSOP ops

-n 0 - 15, optionally specified sub-station ID (SSID)

Entering a callsign here permits the owner of the call to perform sysop functions remotely. Sysop functions include editing, reading, and killing any mailbox message. When this parameter is blank, the remote user may only read non- P messages and messages to or from himself. Furthermore, he may only kill messages to or from himself plus any messages of type "T"(raffic).

This parameter may be reset to the blank (no remote sysop) state by entering a "%" or "&" blanking code.

RVfalway **ON|OFF** Mode: Mailbox Default: ON

Parameters:

ON Initiates forwards and reverse forwards of all forwardable messages

OFF Mailbox ignores Forward and NODEforw commands

The setting of RVFALWAY(s) controls whether the TNC will initiate forward events (FORWARD, NODEFORW) in the absence of forwardable messages. If OFF, the TNC will ignore FORWARD and NODEFORW commands entered in the absence of forwardable messages. When ON, the TNC runs the event for the sole purpose of eliciting reverse-forwardable messages from the remote BBS.

TImedcmd Mode: Mailbox Default:" "

[string- max 119 chars]

This string in the TIMEDCMD parameter is executed as a TNC command whenever the minutes register in the time of day clock equals the value in the TIMEDMIN parameter. The string is executed when seconds equals one; execution is deferred while the user is entering a command.

TIMEDMin n Mode: Mailbox Default: 60

Parameters:
n 0 - 60, specifying 1 minute intervals

The TIMEDMIN parameter is compared against the minutes register of the real time clock to determine when the TIMEDCMD string is sent to the command interpreter. Setting this parameter to 60 disables the feature. Combined with the TIMEDCMD string, the user may configure his TNC to perform hourly automatic forwards and reverse forwards.

REVFlim call[-n] Mode: Mailbox Default: " "

Parameters:
Call **Callsign** of BBS to enable Reverse-forwards

-n 0 - 15, an optionally specified sub-station ID (SSID).

When this parameter is empty, the mailbox reverse forwards all of its messages eligible for forwarding to the first SID compatible BBS to elicit a reverse forward with "F>." Since this permissive technique is vulnerable to a malevolent operator who might attempt to connect and force your mailbox to forward to him, the REVFLIM parameter is provided to limit your mailbox's response to other's reverse forward requests. Simply place the callsign of the BBS you wish to enable reverse forwarding to in this parameter to limit remotely-initiated reverse forwarding to only that callsign.

MAILLED ON|OFF Default: ON

When **MAILLED** is On, the TNC's STA LED will flash on and off while not connected to indicate the presence of mail in the TNC mailbox. The STA LED reverts to its normal function, lit when unacknowledged packets are pending, if the TNC is in a CONNECTED state or if MAILLED if OFF.

Appendix

Modify MFJ TNC for 19200 Baud Terminal baud rate

The user can now have the capability of performing operations at 19.2K baud to the terminal. This is necessary for efficient performance on 9600 baud operations. Please follow the below steps carefully in order to perform the modification properly:

1. Remove all power and cables from the MFJ TNC2.
2. Remove the MFJ TNC2 motherboard out of the chassis completely.
3. Refering to Figure 1A, locate the Dip Switch SW4 and IC U1.
4. Cut the trace indicated on Figure 1A, between SW4 and U1 using an Xacto knife. Be careful ~~as~~ to ~~not and~~ cut no other traces. This could render the TNC non-operational!

Note: In order to perform the next step properly position the TNC2 motherboard so the LEDS are facing you. Now take and flip the motherboard over backwards. If done properly the LEDS will now be facing away from you and you'll be looking at the underside of the TNC2 motherboard.

5. Refering to Figure 1B, connect a jumper from U1 pin 10 to SW4 pin 1. Be sure to make the jumper connection properly other you could lock the TNC2 into 19.2K baud operation. So be sure of your connections.
6. Replace U3 with an LM348 or a TLO84 or equivalent.

The Dip Switch has now been configured for 19.2K Baud and switch are as follows:

Switch Position ON	Selected Terminal Baud Rate
1	19,200
2	1200
3	2400
4	4800
5	9600

All other switches are OFF

The out-going radio Baudrate has not been changed and the switch should be as follows:

Switch Position ON	Selected Radio Baud Rate
6	300 (HF)
7	1200 (VHF)
8	Baud Rate selected for external modem, such as the MFJ-2400 or the MFJ-9600

All other switches are OFF

7. With the TNC2 motherboard still out of the chassis ensure the power switch is in the OFF position.

8. Connect the computer and radio interface cables and power supply cord to the TNC2 motherboard.

9. Load the computer's terminal program and set the Baud Rate in the terminal program to 19,200 Baud if supported.

10. Position the Dip Switch SW4 switch #1 is in the ON position and Switches 2, 3, 4 and 5 are in the OFF position.

11. Position Dip Switch SW4 so the appropriate switch is ON for the mode you desire to operate.

12. Position the Power Switch to the ON (IN), and verify that the TNC2 initializes with the sign-on message. If not, go back and set up the Dip Switches as they were before the modification was performed. This will enable you to check to see if it still functions as before. If this works then you will need to go back through the above steps and find where the mistake was made in the modification.

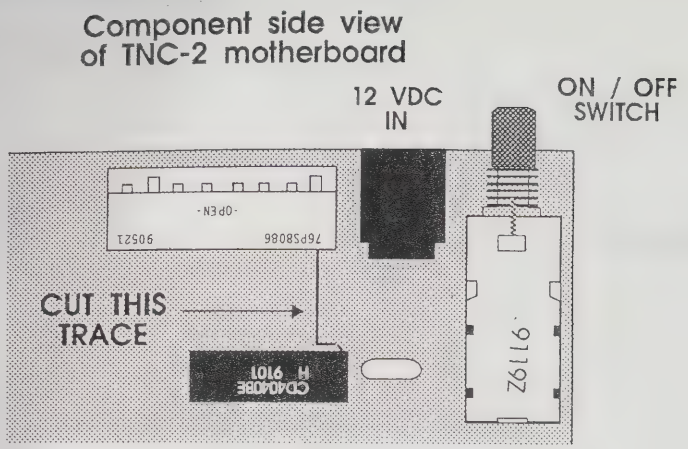


Figure 1A:

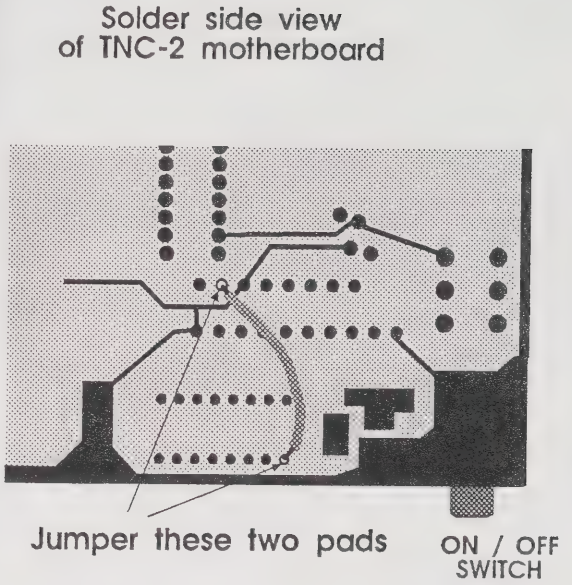


Figure 1B:

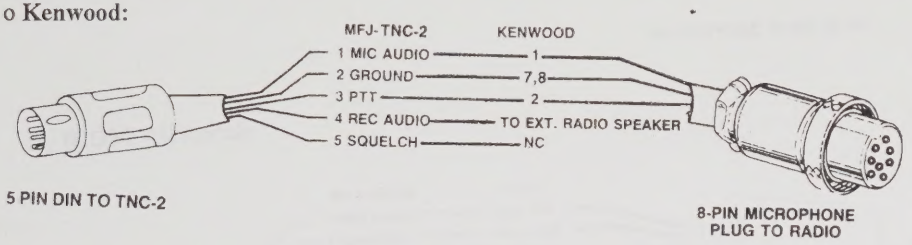
Radio Cable Wiring Diagram:

The radio connection information listed in this section is believed to be accurate. However, you should check the accuracy of this information with the instruction manual of your radio. MFJ Enterprises, Inc. is not responsible for any inaccuracy of this information.

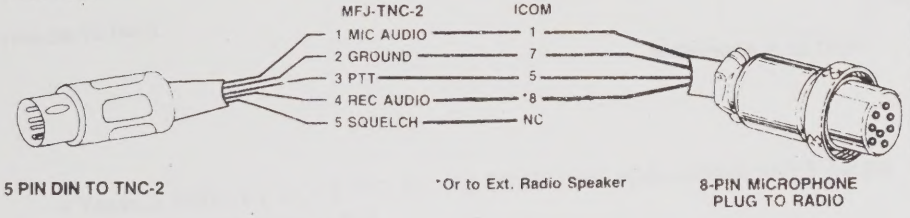
Some pre-assembled cables are available for connecting the TNC-2 to your radio. Contact MFJ dealer or MFJ for detail information concerning TNC-to-Radio pre-assembled cables.

A. 8-pin Microphone Connector:

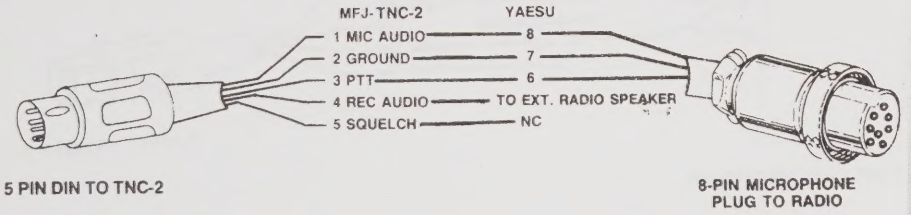
o **Kenwood:**


MFJ-TNC-2
KENWOOD
1 MIC AUDIO — 1
2 GROUND — 7,8
3 PTT — 2
4 REC AUDIO — TO EXT. RADIO SPEAKER
5 SQUELCH — NC
5 PIN DIN TO TNC-2
8-PIN MICROPHONE PLUG TO RADIO

o **ICOM:**

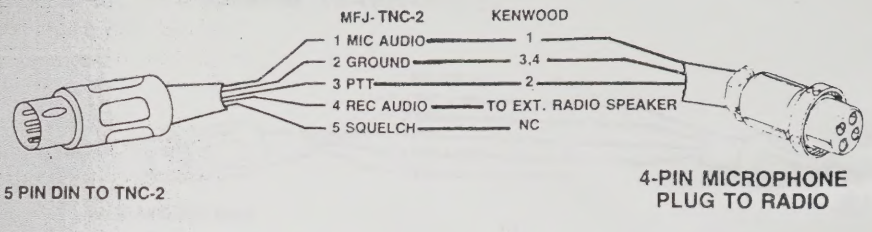


o **Yaesu:**

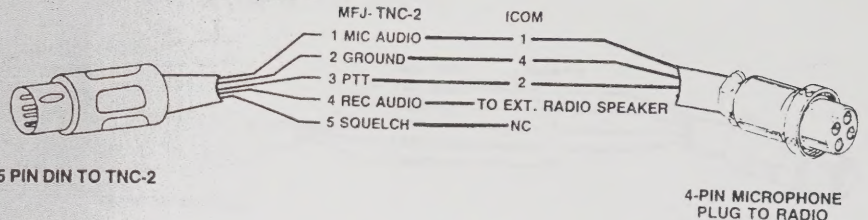

MFJ-TNC-2
YAESU
1 MIC AUDIO — 8
2 GROUND — 7
3 PTT — 6
4 REC AUDIO — TO EXT. RADIO SPEAKER
5 SQUELCH — NC
5 PIN DIN TO TNC-2
8-PIN MICROPHONE PLUG TO RADIO

B. 4-pin Microphone Connector:

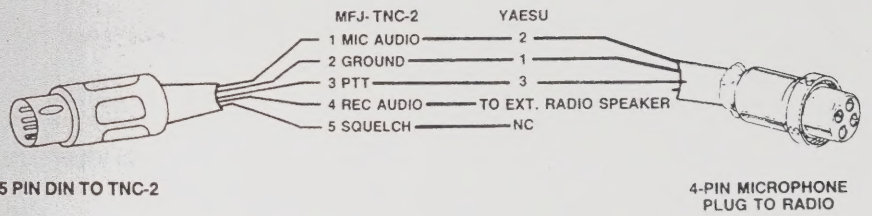
o **Kenwood:**


MFJ-TNC-2
KENWOOD
1 MIC AUDIO — 1
2 GROUND — 3,4
3 PTT — 2
4 REC AUDIO — TO EXT. RADIO SPEAKER
5 SQUELCH — NC
5 PIN DIN TO TNC-2
4-PIN MICROPHONE PLUG TO RADIO

o **ICOM:**

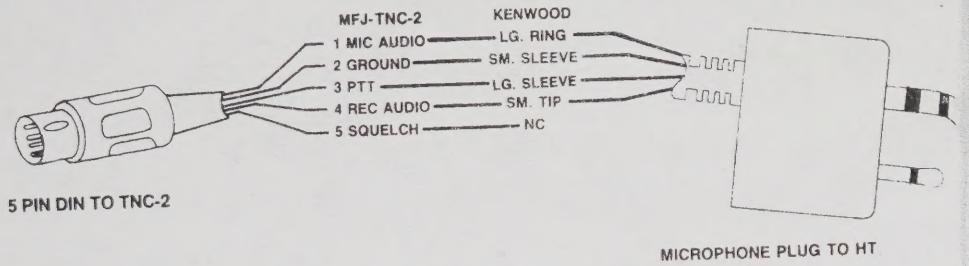

MFJ-TNC-2
ICOM
1 MIC AUDIO — 1
2 GROUND — 4
3 PTT — 2
4 REC AUDIO — TO EXT. RADIO SPEAKER
5 SQUELCH — NC
5 PIN DIN TO TNC-2
4-PIN MICROPHONE PLUG TO RADIO

o **Yaesu:**

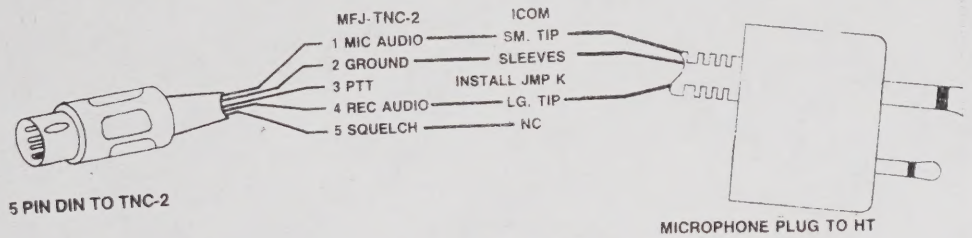

MFJ-TNC-2
YAESU
1 MIC AUDIO — 2
2 GROUND — 1
3 PTT — 3
4 REC AUDIO — TO EXT. RADIO SPEAKER
5 SQUELCH — NC
5 PIN DIN TO TNC-2
4-PIN MICROPHONE PLUG TO RADIO

C. Handheld Radio Connector:

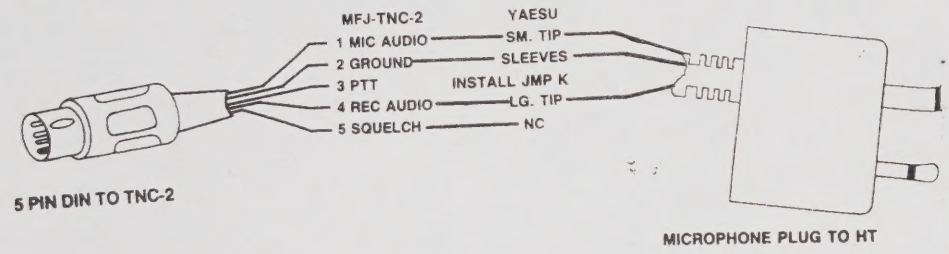
o **Kenwood**: x600, x1, x15, x5 and other models with are pin compatible with these radios.


MFJ-TNC-2
KENWOOD
1 MIC AUDIO — LG. RING
2 GROUND — SM. SLEEVE
3 PTT — LG. SLEEVE
4 REC AUDIO — SM. TIP
5 SQUELCH — NC
5 PIN DIN TO TNC-2
MICROPHONE PLUG TO HT

o **ICOM**: All models

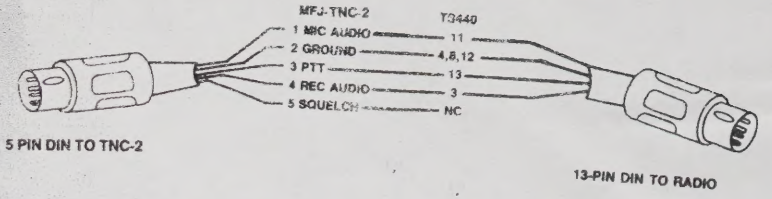


o **Yaesu**: FT-x09, FT-x3, FT-727, FT-470, FT-X11 and other models which are pin compatible with these radios.



D. **Using the Accessory Jack**

o **Kenwood**: TS-440S (ACC 2)



o **ICOM**: IC-735 (ACC 1)